

A mining research contract report  
DECEMBER 1986

*City Council*

*OLGA*

*Bump*

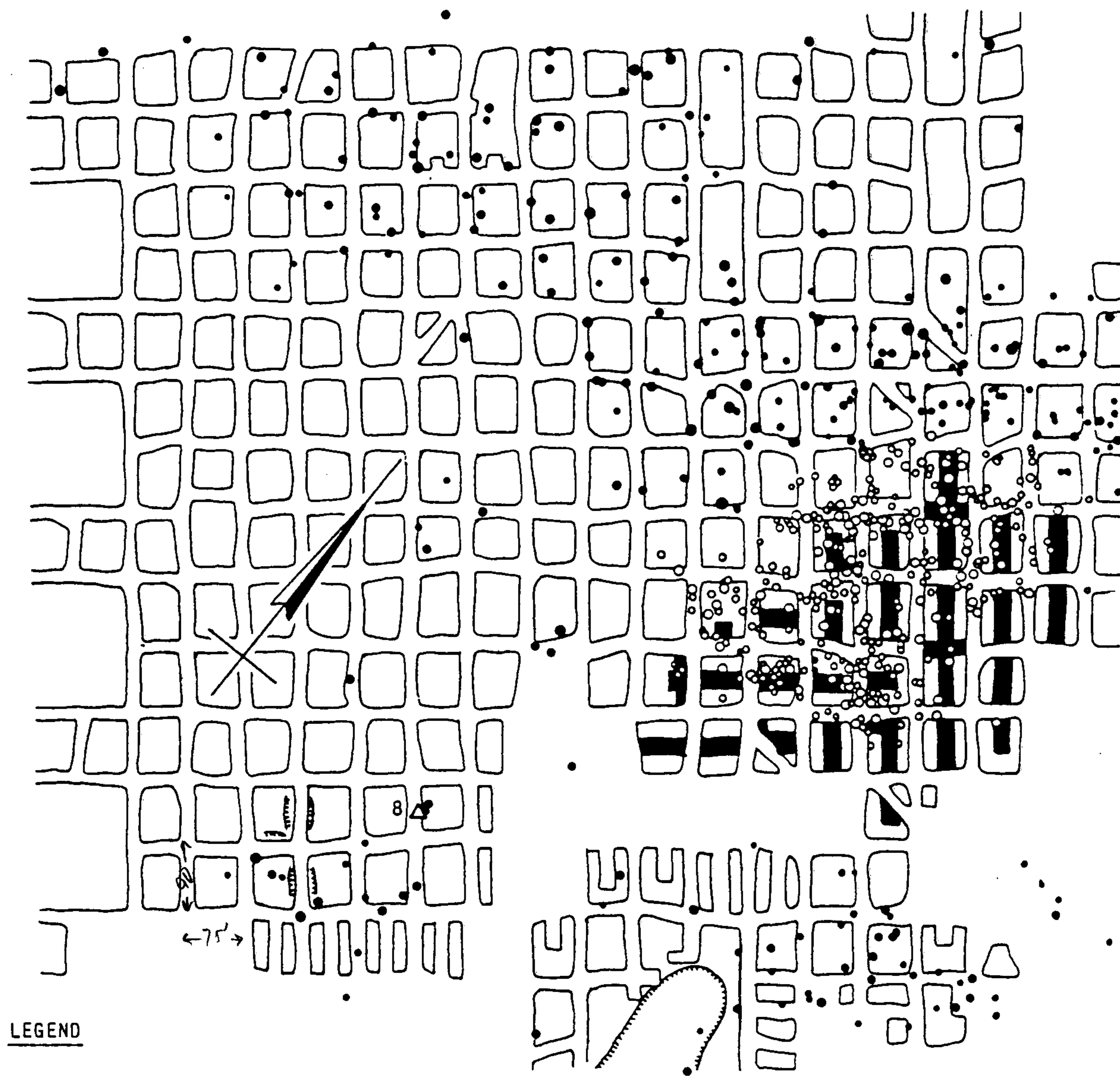
# COAL MINE BUMP MONITORING

*JUNE 3, 1985*

Contract No. J0245009  
Colorado School of Mines  
Excavation Engineering and  
Earth Mechanics Institute  
Golden, Colorado 80401

BUREAU OF MINES  
UNITED STATES DEPARTMENT OF THE INTERIOR





# **LEGEND**

- ○ Microseismic events of direct response to mining
- ● Microseismic events of secondary response
- ▬ Location of mining which triggered microseismic response
- ⌋ Bumped ribs
- <sup>8</sup> △ Location of 8 geophone

0 100 200 400  
 ───────────  
 Scale, feet

FIGURE 28. - Microseismic event distribution in 9 Right section in May 1985.

stress system over the retreat mining area.

The activity in direct response to mining cycles dominated the first two weeks of the third phase. Then the extensive activity of the secondary response type developed along the haulway (fig.28). During the third week, localized microseismic activity combined with physical indications of increasing horizontal stress in the immediate roof (e.g.: cracks developing in the roof, bolts pulled into the roof), were observed near geophone No. 8 (south of the active mining area; figs.8,28). Both of these locations became quiet near the end of April, although the microseismic activity related directly to the mining continued. During the first two weeks of May, activity around the haulway returned and became even more intensive than previously observed (fig.28). The microseismic activity related to changes in the main stress system also began to develop over the former pillar A area (fig.28). Some bumps occurred in the area of geophone No. 8, resulting in local rib damage (fig.28). Progressing instability, indicated by a rapid growth in the number of microseismic events and their average energy, led to the multiple coal bump phenomenon which occurred on June 3, 1985. At this time about 100 coal blocks in the retreat mining area bumped. The center of the stress release based on microseismic data, was located close to the No. 10 geophone (figs.9,29,30). The height of entries in this area was reduced by over two feet mostly in result of the immediate floor heave along the entries.

Two distinct types of stress adjustment through failure development were detected based on the sequence of event locations over the retreat mining area (fig.29):

- a. Radial stress adjustment with respect to the center of the overall failure around the No. 10 geophone, is marked in figure 29 with

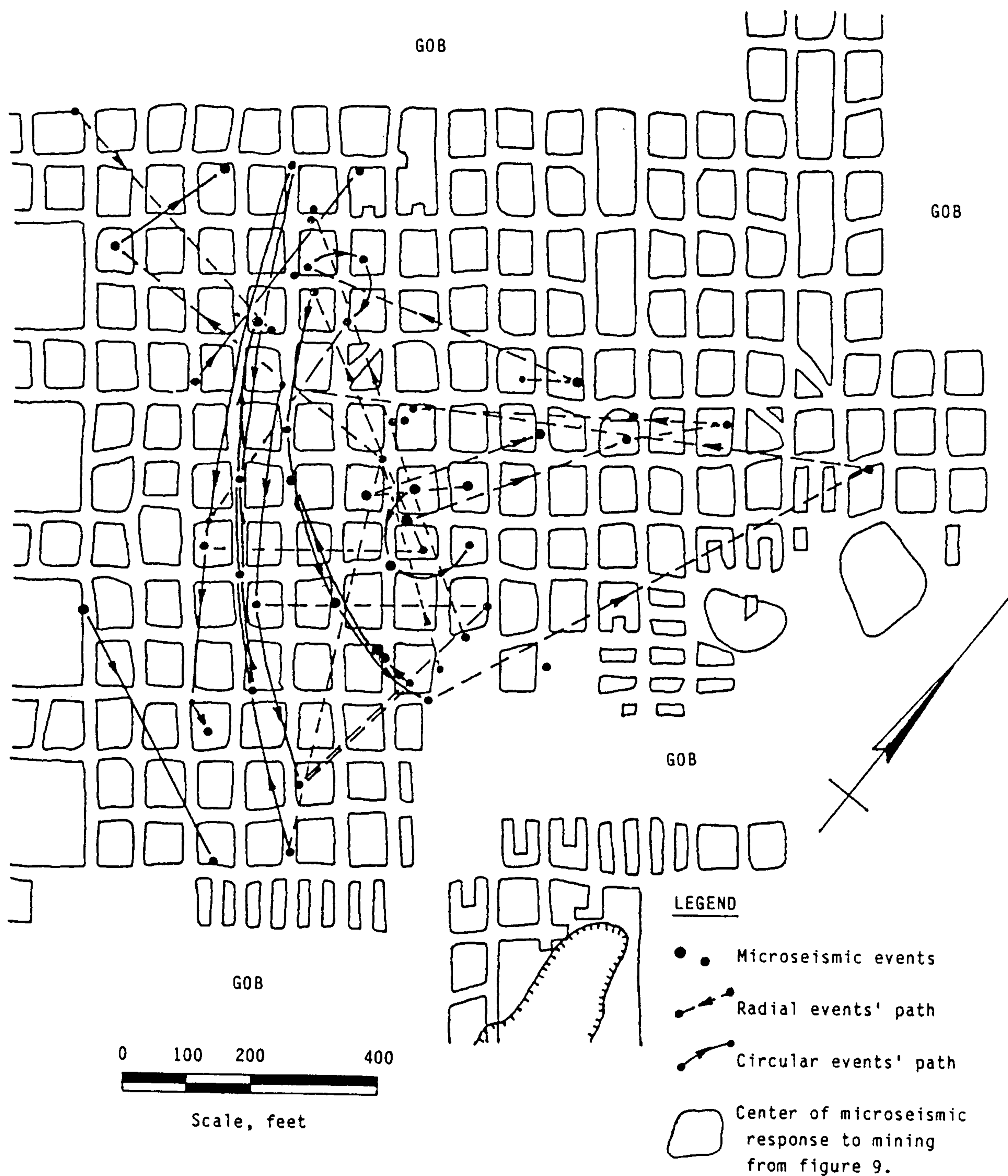


FIGURE 29. - Event paths equivalent to principal directions of stress redistribution over retreat mining area B on June 3, 1985.

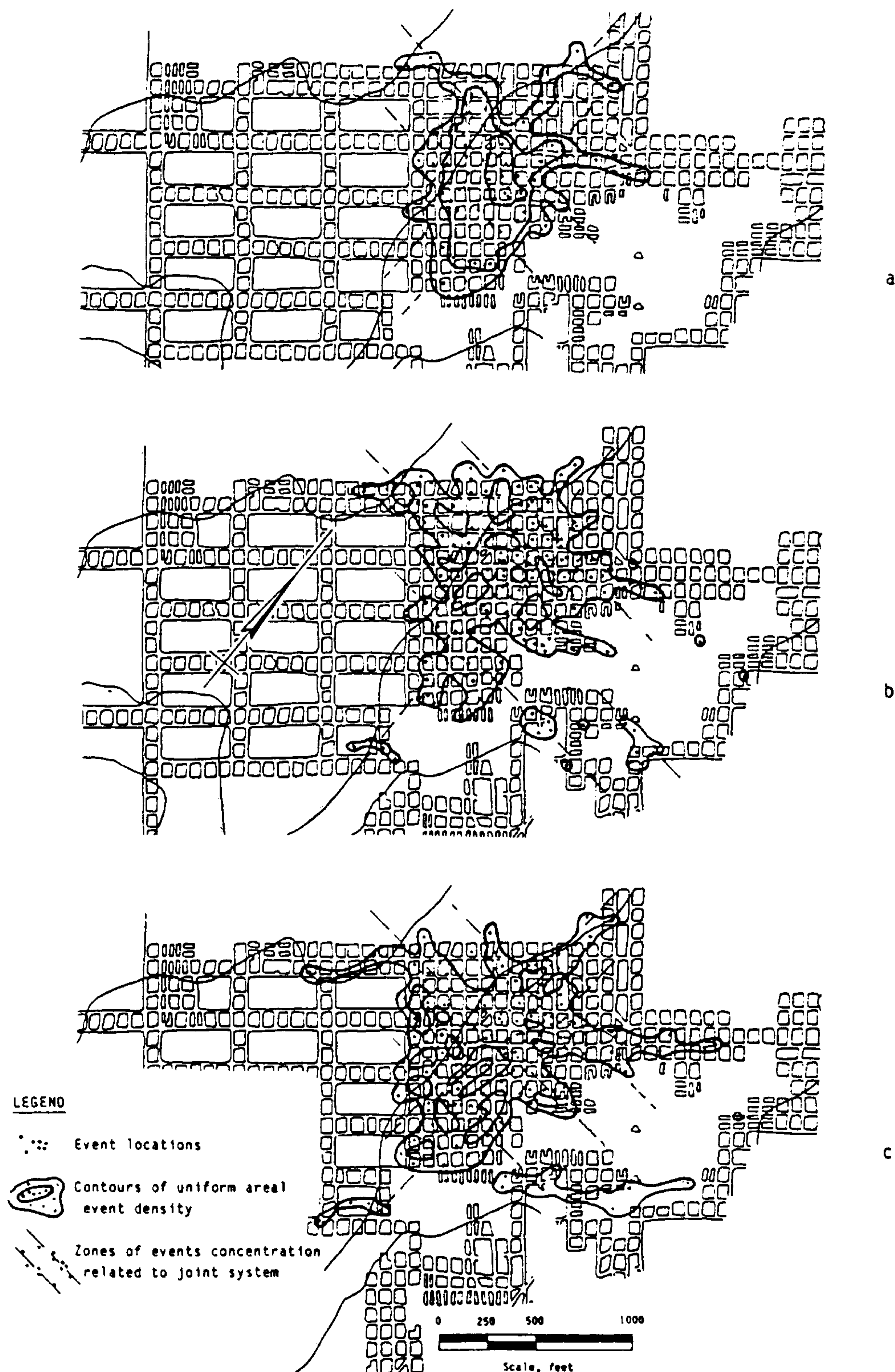
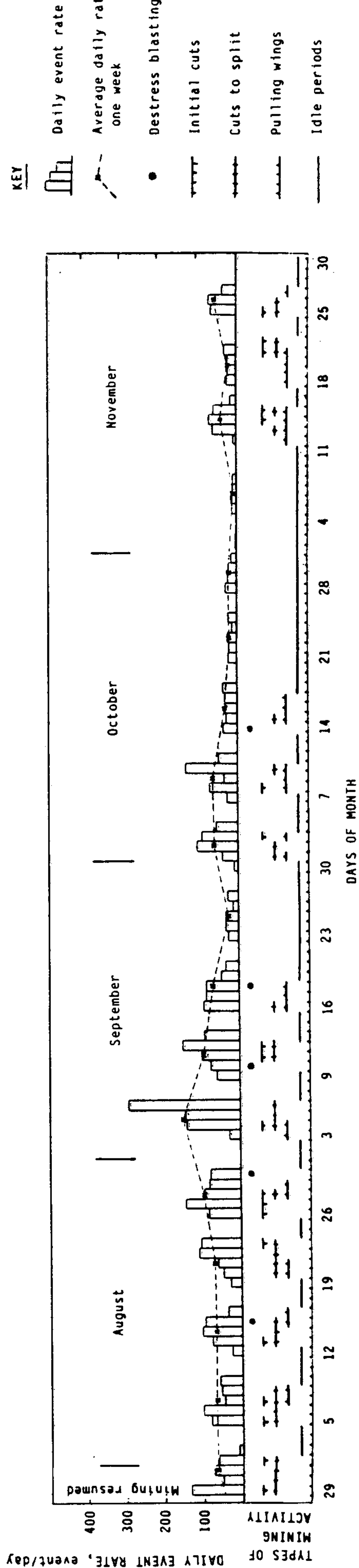
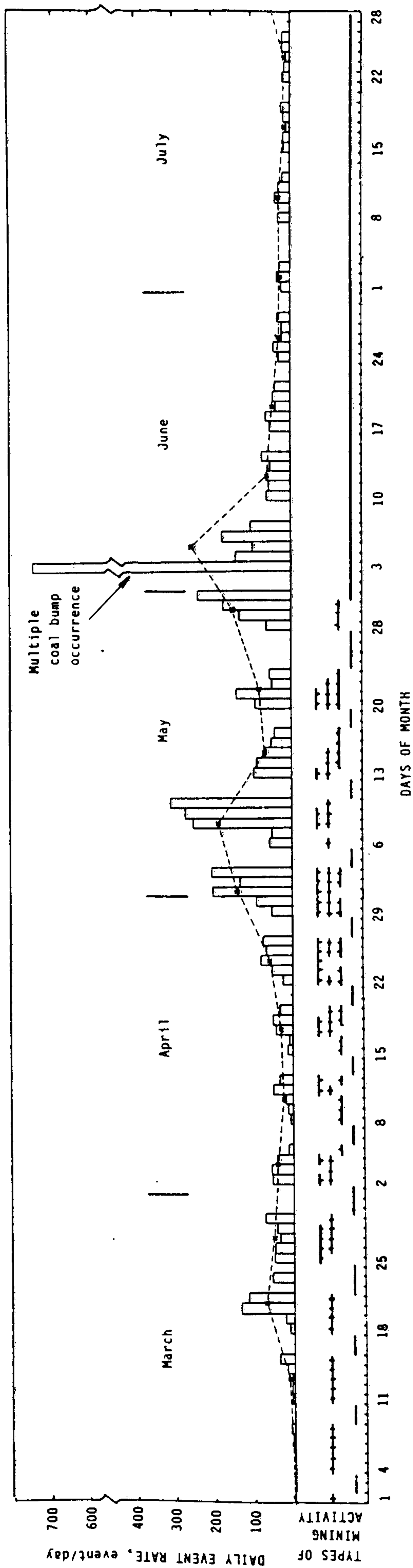


FIGURE 30. - Microseismic event distribution and contours of uniform event areal density over 9 Right section in June 1985: a, on June 3; b, from 4 to 15; c, from 16 to 28.



# KEY

- Daily event rate
- Average daily rate over one week
- Destress blasting
- Initial cuts
- Cuts to split
- Pulling wings
- Idle periods

FIGURE 37. - Daily event rate plot and types of mining activity in 9 Right section from March to

November 1985. With a few exceptions, no monitoring on weekends.